UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
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DEC 23 2014

Michelle Morin
Chief, Environment Branch for Renewable Energy
U.S. Department of the Interior
Bureau of Ocean Energy Management
Washington, D.C. 20240-0001

Re: Cape Wind Energy Project, Facilities Design Report and Fabrication and Installation Report (FDR/FIR) and revised Construction and Operations Plan (COP)

Dear Ms. Morin,

The Bureau of Ocean Energy Management's (BOEM) requested our concurrence with your determination that Cape Wind Associates' (CWA) July 25, 2014 Facilities Design Report and Fabrication and Installation Report (FDR/FIR) and revised Construction and Operations Plan (COP) do not require reinitiation of consultation pursuant to Section 7 of the Endangered Species Act (ESA). In particular, BOEM has determined that reinitiation is not required because the modifications to the identified action will not cause any affects to listed species or critical habitat not previously considered in the 2010 Biological Opinion. We agree with your determination. Our supporting analysis is presented below.

Changes to the Proposed Action
A description of the proposed action was included in the 2010 Opinion. We incorporate that description by reference. With the exception of what is described below, the proposed action remains as it was described in the December 30, 2010 Opinion.

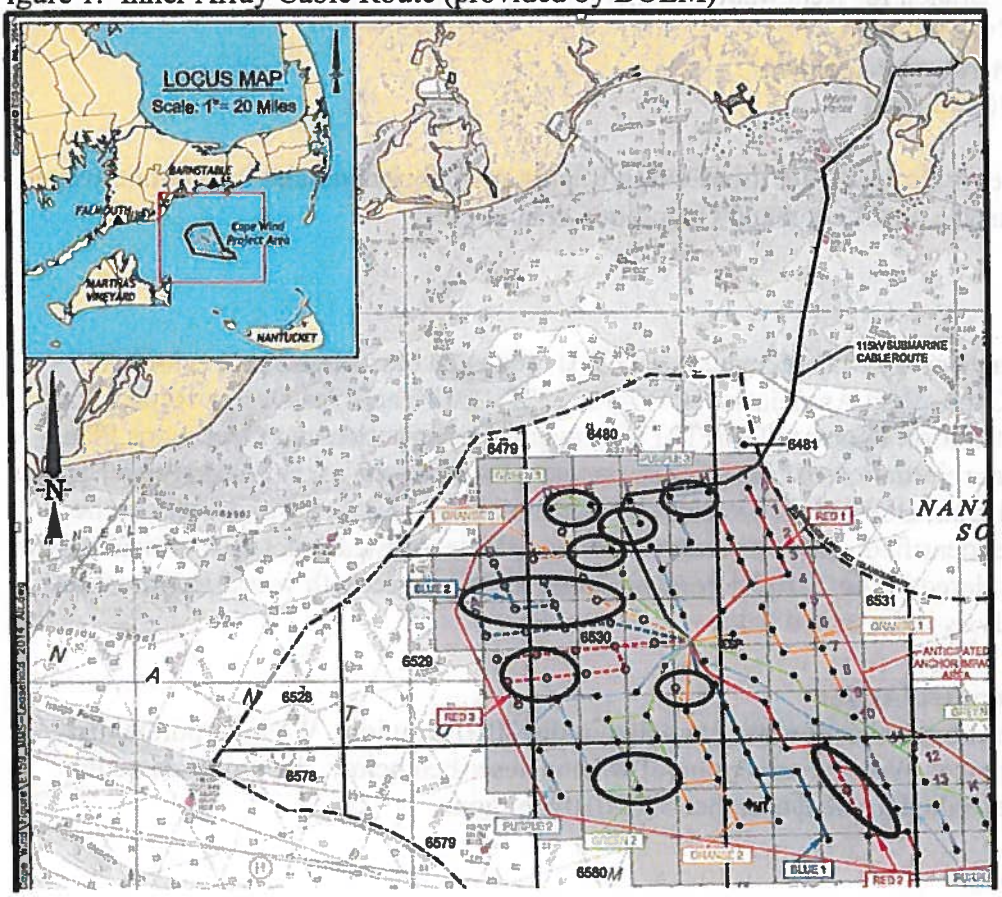
Timing of Construction
In the 2010 Opinion, we stated that construction was planned to take place over a 5-9 month period between April and November, the full period of which would result in construction occurring over two seasons. CWA has provided BOEM with additional details on the construction schedule that clarify when different activities will take place. In the July 2014 COP, CWA states that during the first season of construction ("Season A", currently scheduled to occur between April and August 2015), the monopiles to support 101 turbines would be installed. During the second season, the remaining 29 monopiles will be installed ("Season B", commencing after April 2016). Installation of scour protection will follow monopile installation in the same year. Intra-array cable installation would also follow in the same year as monopile installation. Submarine cable installation (connection to shore) would occur in the second construction season (2016). In-water construction work for the Electrical Service Platform

(ESP) is currently scheduled for the first season with topside work scheduled for the second season.

Inner-Array Cable Route

CWA has made minor modifications to the inner array cable routing. In addition, the total length of the cable route is increased to 70 miles from 66.7 miles, an increase of approximately 3.3 miles. The inner array cable route is illustrated in Figure 1. As illustrated in Figure 1, cable installation will occur in two construction seasons.

Figure 1. Inner Array Cable Route (provided by BOEM)



Legend

- Solid lines are Season A cables
- Dashed lines are Season B cables
- Ovals indicate areas of cable route changes from original COP

Electrical Service Platform Design

The ESP's fixed template-type jacket frame foundation system (COP section 4.1.5) has been revised from the originally proposed single, large, jacket frame anchored with 6 driven foundation piles to an updated design that requires two smaller, separate, jacket frames, each anchored with 4 driven foundation piles (for a total of 8 piles). The diameter of the piles (approximately 42") remains unchanged. The COP (p. 84) describes the installation of the ESP

jackets as follows: "The jacket will be transported to the site on a jack up transport barge. Once on site, the jacket is expected to be lifted from the transport barge by a crane mounted on a separate jack up barge." The jackets will be installed from a floating barge rather than a jack up barge. The topside installation procedure is a float-over and remains as described in the COP.

The dimensions of the ESP have also changed. The ESP will be smaller (132' x 115' (15,180 square feet; compared to 100' x 200' (20,000 square feet as originally planned) and will not rise as far off the water. The first deck will be approximately 35' above MLLW and rising 47' to the roof compared to the original design of the 1st deck of the ESP to be approximately 39' above MLLW and rising 49' to the roof.

CWA is also planning to install 3 rather than 4 transformers at the ESP, with a total of 30,000 gallons of transformer cooling oil (compared to 40,000 gallons originally considered).

Pile Installation

CWA plans to use an IHC S-1800 hydrohammer, a Menck 1900S impact hammer or an equivalent hydraulic impact hammer with a comparable energy rating to drive the monopiles to grade.

BOEM will require that CWA employ a noise attenuation system (NAS) during pile driving operations to ensure that: the radius of the 180 dB re 1uPa peak isopleth does not extend beyond 750 m; the radius of the 160 dB re 1uPa RMS isopleth does not extend beyond 3.4 km during impact pile driving; and, the radius of the 120 dB re 1uPa RMS isopleth does not extend beyond 3.4 km during vibratory pile driving. CWA is proposing to use a large bubble curtain system as a noise attenuation system (NAS) for all pile driving. Sound source verification will be required for the first pile installed with the impact hammer and the first time a vibratory hammer (see below) is used. If the size of these isopleths is greater than these distances, BOEM will require CWA to employ additional mitigations that are effective in achieving the required reductions. BOEM confirms that should an additional sound barrier be needed, the bubble curtain system has the inherent flexibility to accommodate this requirement.

BOEM estimates that while specific actual installations will vary in performance, a single bubble curtain is predicted to reduce noise levels by 8-14 dB (peak). This prediction is considered to be an effective quantification of relative performance that can be used to support the evaluation of potential pile installations (Stokes *et al.* 2010). A report published by the German Federal Agency for Nature Conservation (2013) documents that reductions of 8-14 dB (peak) were achieved with the single ring bubble curtain in water depths from 23-33 m.

The bubble curtains act as a direct reduction of the source level. Assuming standard 20 log(R) spherical spreading (as described in BOEM's effects analysis this is a reasonable assumption considering the relatively shallow depths and short distances being discussed), a single bubble ring will result in noise levels as described in Table 1. Modeling has not been carried out for installation of the 8 42" piles that will support the ESPs. However, because underwater noise is directly related to pile diameter (i.e., larger diameter steel piles will be louder than smaller diameter steel piles when installed in the same area with the same equipment; Illingworth and

Rodkin 2007), the results presented in Table 1 represent an extreme worst case for the eight 42" piles, which are about 20% the diameter of the monopiles.

Boulder Mitigation

Geotechnical and geophysical investigations on the Project Site have confirmed that the site is potentially populated with a variety of large glacial erratics (boulders) on the surface of and in the top 10 m of the soil matrix. In the event that a boulder is encountered during the installation of a monopile, CWA has proposed the use of four possible methodologies to mitigate for boulders: driving through a boulder with the impact hammer, use of a vibratory hammer, clamshell extraction or drilling through the boulder. Boulder mitigation was not described as part of the proposed action in the 2010 Opinion.

Driving through a boulder with the impact hammer

Foundation monopiles are designed to be driven to full penetration with a hydraulic impact hammer. If a boulder is encountered during driving, the selected hammer may drive through the boulder. According to BOEM, this has been successfully done on European projects.

Vibratory hammer

Test installations have been done using vibratory hammers on European offshore wind projects (de Neef et al., 2013) and more are in progress (RWE Innogy, 2014). BOEM states that fatigue analysis has shown that using the vibratory hammer is within the foundation design standards and will allow multiple attempts of re-driving the pile. A pile that is partially driven and encounters refusal due to a boulder could be extracted by the vibratory hammer and moved to a new location. Further engineering analysis is underway to confirm the suitability of this option. If a vibratory hammer is chosen as the preferred boulder mitigation method, CWA will use the Cape Holland Super Triple Kong vibratory hammer system. The Super Triple Kong is comprised of three APE 600 vibratory driver/extractors.

Clamshell extraction

Given the large diameter of the monopiles, it may be possible to extract the boulder from inside the monopile with a clamshell dredge. This is potentially the fastest method, but its effectiveness depends on site-specific conditions.

Drilling

A drill that fits closely inside the monopile could be lowered to the soil plug present at approximately the seabed elevation. As the drill is rotated and advanced to the boulder, a reverse circulation (airlift) process will be used to remove the cuttings in a controlled manner through the center drill pipe. Driven by the water pressure and the rapid expansion of the injected air, an air- water mixture will quickly flow upwards in the drill pipe, pulling the drill cuttings along with the flow. The cross-flow of water from the drill annulus below the full-face bit will carry drill cuttings to the center pipe and subsequently to the surface for disposal by appropriate means. It may be necessary to deploy under-reaming bits to clear the boulder from below the pile tip, and once the obstruction has been passed, the drill will be retracted and the monopile will be advanced again by a hydraulic or vibratory hammer.

Table 1: Sound source levels for equipment to be used during Cape Wind construction operations (provided by BOEM)

Source	RMS noise level at distance from source			Peak noise level at 1m
	1m	750m	3400m	1m
Impact Hammer IHC S1800	235	178	164	241
Impact Hammer Menck 1900 S	235	178	165	241
Vibratory hammer	204	147	134	220
Clamshell Dredge	153	96	83	163
Drilling	124	67	54	127

Scour Protection

In the 2010 Opinion, we considered the effects of both scour mats and rock armor for scour protection at each of the turbine foundations. The use of scour mats is no longer being considered. Rock armor will be used as described in the 2010 Opinion. The only change is that prior to either filter or armor stone placement, a multi-beam survey will be performed to create a baseline for quality control of layer thickness/position and for As-Built documentation. Real time surveying of the rock placing work will be performed utilizing multi-beam sonar equipment during placing operations as a quality control measure to ensure the rock is placed in the correct location and thickness. Once the quality control surveys have shown the scour design parameters have been met, a final survey of both the filter and armor layers will be performed to be incorporated as the As-Built documentation.

Other Changes

Other changes to the proposed action include the change of the connector transitioning the cables from the seabed into the foundation termination point, from a "J-tube" design, to one utilizing a Tekmar cable protection system. The revised COP also incorporates the superseding provisions of the interim Marking and Lighting Changes issued by the FAA on May 25, 2014, and further provides that the Project will at all times conform to the FAA requirements that are in effect. These revisions will have no effect to marine ESA-listed species because they involve changes to the project above the water where these species do not occur and their effects do not extend into the marine environment. Therefore, these revisions are not further assessed in this document.

Effects of Proposed Changes on right, humpback and fin whales and loggerhead, Kemp's ridley, green and leatherback sea turtles

Construction Schedule

In the 2010 Opinion, we considered that all in-water construction of the 130 WTGs would occur over a 5-9 month period between April and November and that construction could occur

in two construction seasons. The additional details provided on the construction schedule do not change the time of year when construction will take place nor do they change the types of activities that will occur. Therefore, the additional details on construction schedule do not introduce any effects not considered in the 2010 Opinion.

Inner Array Cable Route

In the 2010 Opinion, we considered the effects of installation and maintenance of 66.7 miles of submarine cable. CWA is now proposing to install approximately 70 miles of cable, an increase of about 3.3 miles (5%). No changes to the installation methodology are proposed. Effects considered in the Opinion included: the potential for interactions with the cable laying equipment; temporary loss of benthic resources for foraging sea turtles; exposure to increased turbidity and suspended contaminants; and exposure to the cable's electromagnetic field (EMF). It is important to note that the 3.3 miles of additional cable will occur in the same locations we considered for installation of cable in the 2010 Opinion. In the 2010 Opinion, we considered effects of installation of the cable via jetplow. We analyzed the potential for interactions with the cable laying equipment as well as the effects of destruction of prey, loss of benthic resources, turbidity, suspended sediments and exposure to the cable's electromagnetic field. We concluded that all effects of cable installation to listed whales and sea turtles would be insignificant and discountable. The small increase in the amount of cable to be installed does not introduce any new effects that were not considered in the 2010 Opinion. The effects previously analyzed would also occur over the extra 3.3 miles. However, given the installation methodology and habitat characteristics are the same for the extra 3.3 miles of cable, we expect the additional effects would also be insignificant and discountable as would the aggregate effects of laying the full 70 miles of cable.

Electrical Service Platform

In the 2010 Opinion, we considered the acoustic impacts of installing piles to support the ESP as well as effects to benthic habitat and prey resources from the construction and operation of the ESP. Construction of the ESP will now involve the driving of eight 42-inch diameter piles instead of six 42-inch piles. This is less than a 1.5% change in the total amount of piles to be driven for the entire project, when compared to the 2010 Opinion. Effects of pile driving are discussed below. The additional two piles will result in a slight increase in the amount of benthic disturbance (<2 m^2 of additional impact); however, that increase is so small it would not have a detectable impact on listed species. The effects to listed whales and sea turtles from an ESP supported by eight piles will be the same as the effects of an ESP supported by six piles. These modifications to the ESP foundation configuration present a very minor, insignificant change in the impacts previously identified and evaluated in the 2010 Opinion.

As noted in the 2010 Opinion, an oil spill would be an unintended, unpredictable event. The ESP will now house three transformers instead of the four considered in the 2010 Opinion. This results in a 25% reduction in the amount of transformer cooling oil on the ESP. There are no effects to listed whales or sea turtles from the storage of a smaller amount of cooling oil on the ESP that were not considered in the 2010 Opinion.

In the 2010 Opinion, we considered that the ESP would be installed from a jack-up barge. CWA is now proposing to use a floating barge for installation of the ESP. The impacts to the benthos

from the floating barge are expected to be the same as for a jack-up barge as a similar area of the bottom will be disturbed; there are no effects of using a floating barge that were not considered in the 2010 Opinion.

Construction Methodology

Pile Driving

The possible acoustic effects of pile driving during project construction on marine mammals and sea turtles are discussed in detail in the 2010 Opinion. Effects of pile installation considered in the Opinion included acoustics (potential for injury and behavioral disturbance), water quality (turbidity) and impacts to benthic resources and habitat. The piles are the same size considered in the 2010 Opinion and the general installation method remains the same (pile driving). The installation of two additional piles will result in a very minor, insignificant impact on water quality, benthic resources or habitat that will not have a detectable effect on listed species incrementally or in the aggregate. Here we consider further the acoustic effects of pile installation. As explained in the 2010 Opinion, we considered the potential for injury to listed whales if exposed to underwater noise louder than 180 dB re 1uPa RMS and the potential for a behavioral response to impulsive noise of 160 dB re 1uPa RMS or louder and continuous noise of 120 dB re 1uPa RMS or louder. For sea turtles, we do not anticipate any potential for injury upon exposure to noise less than 180 dB re 1uPa RMS and do not expect any behavioral response to noise less than 160 dB re 1uPa RMS.

Right, humpback and fin whales

In the 2010 Opinion, we summarized the best available information on the presence of right, humpback and fin whales within Nantucket Sound. We stated that "a review of sightings data compiled by the Northeast Fisheries Science Center, CeTAP study data, the OBIS database, and status of the stock reports indicate that whales are rare visitors to Nantucket Sound, with no sightings of large whales within Horseshoe Shoal."

We determined that "humpback whale occurrence in Nantucket Sound is rare, with transient individuals likely to overlap only sporadically with the eastern extremes of Nantucket Sound (i.e., near Monomoy). The shallow depths of Nantucket Sound and its location outside of the coastal migratory corridor likely minimizes the potential for humpback whales to occur in Nantucket Sound." We also determined that "fin whale occurrence in Nantucket Sound is rare, with transient individuals likely to overlap only sporadically with the eastern extremes of this area, most likely between April and October." We have reviewed Stock Assessment Reports produced since the 2010 Opinion (Waring *et al.* 2014, 2013, 2012, and 2011) and other available sources of large whale sightings (e.g., the OBIS database[1]) and find no additional sightings of humpback or fin whales in Nantucket Sound.

In the 2010 Opinion, we stated that "occasional right whales have been reported off Monomoy and off Great Point, Nantucket (northern tip of the island) but right whales have only rarely been documented in Nantucket Sound (NEFSC unpublished data, Waring *et al.* 2010), and no right

[1] Available at: seamap.env.duke.edu

whales have been sighted on Horseshoe Shoal." Only one historical source included information for a whale in Nantucket Sound. Mate *et al.* (1997) reports data for several North Atlantic right whales outfitted with satellite tags. One right whale female, tagged in the Bay of Fundy on August 24, 1990, transited Nantucket Sound in 1997 accompanied by her calf. However, this whale was only present in Nantucket Sound for a brief period of time (i.e., less than one day) and moved rapidly during that time (i.e., approximately 89.6km/day or 3.7km/hour). We also reported sightings of right whales in or near Nantucket Sound in April and May 2010. We have reviewed right whale sightings data from January 2011 – November 2014 and note that of the hundreds of right whale sightings reported during this period, there were only three sightings recorded on the NEFSC RWSAS during that period (one right whale on April 27, 2011 reported at 41.472, -70.1862; a group of three on April 25, 2011 (reported at 41.5833, -70.1545) and a group of 3 on July 7, 2013 reported at 41.5, -70.5). Additionally, a mother/calf pair was spotted just east of Great Point on April 28, 2013 (reported at 41.3833, -70.05). None of these whales were observed within the area where WTGs will be installed, and the closest whale reported was 4.6 km from the edge of the WTG footprint (see Figure 2a, b, c and d). As stated in the 2010 Opinion, the best available information indicates that like the other large whale species, right whale occurrence in Nantucket Sound is rare, with transient individuals likely to overlap only sporadically (i.e., for less than one day and on no more than a few days per year) with the Nantucket Sound portion of the action area between December and June. There is no new information on the use of the action area by listed whales that would reveal effects of the action not considered in the 2010 Opinion.

Figure 2a. Location of three right whales reported on April 25, 2011. Location Information obtained from Right Whale Sightings Advisory System (http://www.nefsc.noaa.gov/psb/surveys/). Basemap with proposed Cape Wind turbine location obtained from Massachusetts Ocean Resource Information System (MORIS); (http://maps.massgis.state.ma.us/map_ol/moris.php). Distance from sighting to nearest proposed turbine = 14.02km

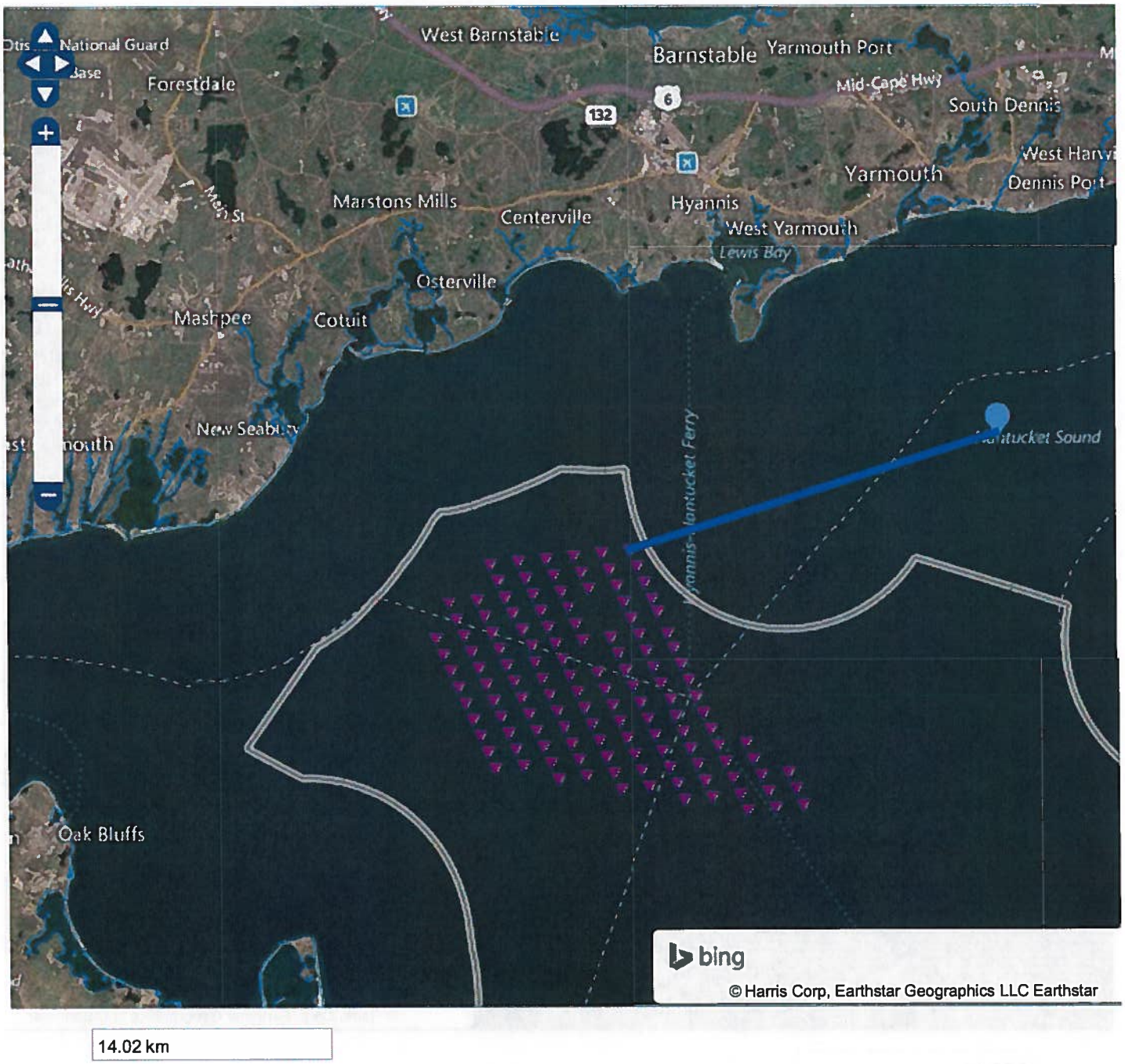


Figure 2b. Location of single right whale reported on April 27, 2011. Location Information obtained from Right Whale Sightings Advisory System (http://www.nefsc.noaa.gov/psb/surveys/). Basemap with proposed Cape Wind turbine location obtained from Massachusetts Ocean Resource Information System (MORIS); (http://maps.massgis.state.ma.us/map_ol/moris.php). Distance from sighting to nearest proposed turbine = 4.64 km

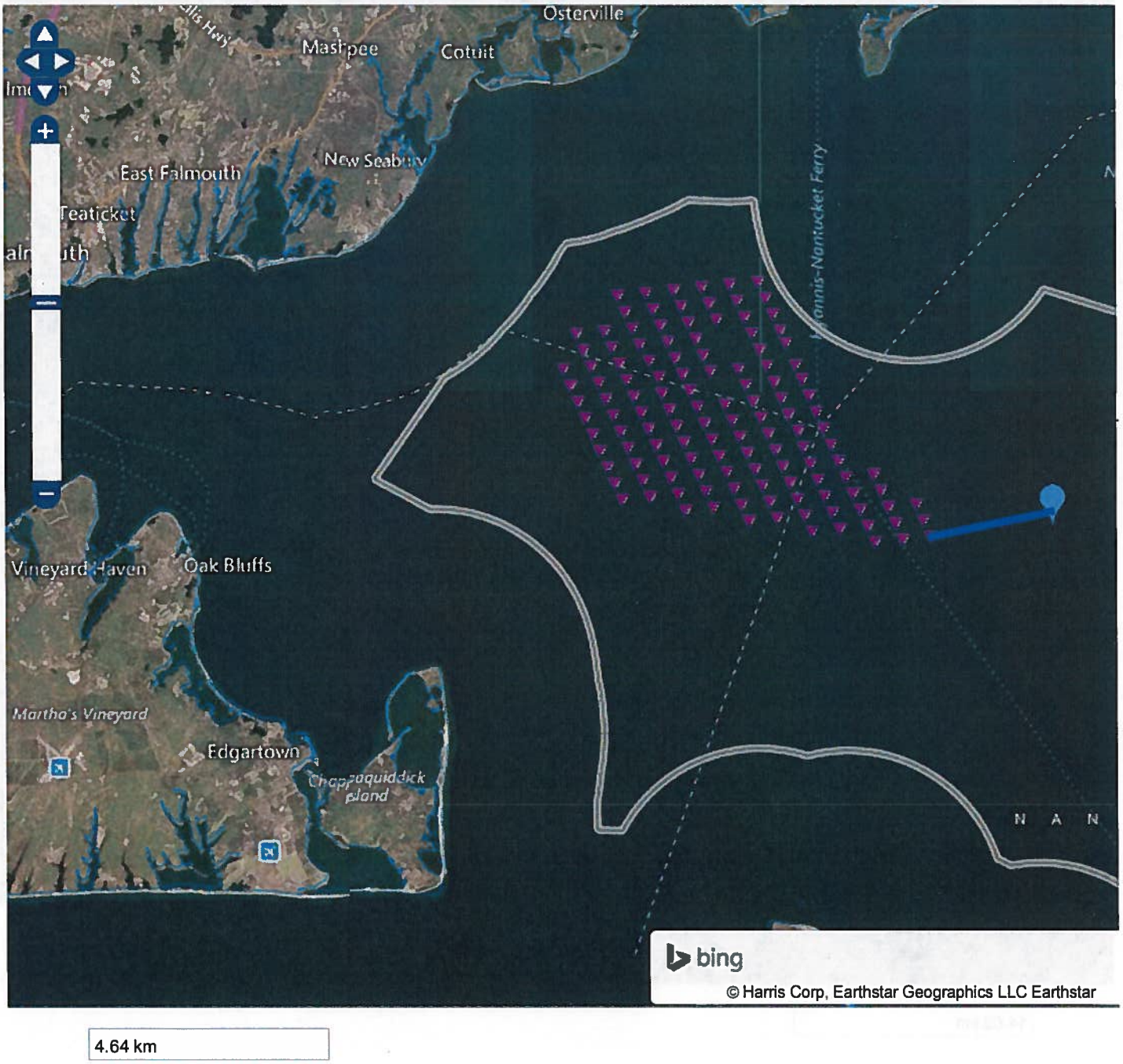


Figure 2c. Location of three right whales reported on July 7, 2013. Location Information obtained from Right Whale Sightings Advisory System (http://www.nefsc.noaa.gov/psb/surveys/). Basemap with proposed Cape Wind turbine location obtained from Massachusetts Ocean Resource Information System (MORIS); (http://maps.massgis.state.ma.us/map_ol/moris.php). Distance from sighting to nearest proposed turbine = 8.8km

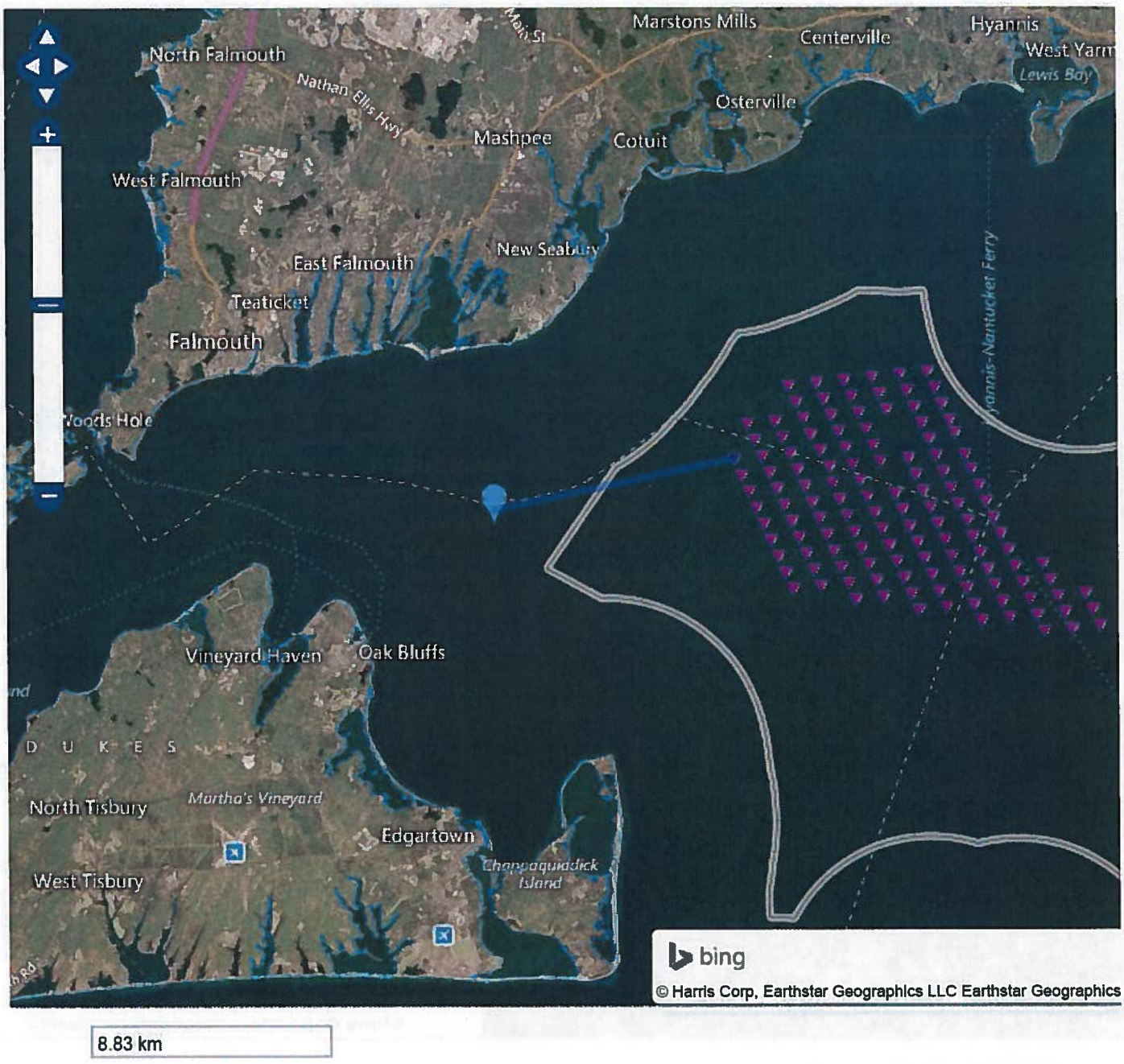


Figure 2d. Location of mother/calf pair of right whales reported on April 28, 2013. Location Information obtained from Right Whale Sightings Advisory System (http://www.nefsc.noaa.gov/psb/surveys/). Basemap with proposed Cape Wind turbine location obtained from Massachusetts Ocean Resource Information System (MORIS); (http://maps.massgis.state.ma.us/map_ol/moris.php). Distance from sighting to nearest proposed turbine = 18.6km

In the 2010 Opinion, we determined that no right, humpback or fin whales would be exposed to potentially injurious or disturbing levels of underwater noise. Here, we review the additional information now available on the precise methodology and equipment to be used to install the ESP and WTG piles.

Use of Impact Hammer

As explained above, the source levels (i.e., the underwater noise expected at 1m from the pile being driven) presented by Cape Wind in their July 2014 filing are louder than the source levels assessed in the 2010 Opinion (241 dB re 1uPa peak with the impact hammer). In the Opinion, we state that we do not anticipate any whales will be present on Horseshoe Shoals during pile installation and therefore, no whales will be exposed to increased underwater noise resulting from pile driving. We also state that in the unlikely event that a whale is within Nantucket Sound during pile driving, the maintenance of the 750m monitored exclusion zone will ensure that no whales will be exposed to potentially injurious levels of underwater noise. Large whales may experience injury upon exposure to noise of 180 dB re 1uPa or louder. In the 2010 Opinion, we considered the effects of pile driving with the 180 dB re 1uPa RMS isopleth extending 500 m from the pile being driven and determined that it was extremely unlikely that any listed whales would be exposed to injurious levels of noise during pile driving. With the noise attenuation system (NAS), the 180 dB re 1uPa RMS isopleth will extend only 3.2-150 m from the pile being driven. It is reasonable to expect that the observer will be able to spot any whale that is within 750 meter exclusion zone. The observer will monitor the exclusion zone for 60 minutes prior to pile driving commencing. Right whales have a maximum dive time of 40 minutes. Because the monitoring period is longer than the maximum dive time, any whale submerged within the exclusion zone would need to come to the surface during the pre-driving monitoring period. We expect an observer would detect either the body of the whale, which is large, or the distinctive blow produced several feet above the water surface when the whale takes a breath. Because pile driving will not occur if conditions are such that the observer cannot adequately monitor the entirety of the exclusion zone, pile driving will not occur when sea surface or weather conditions are such that an observer would not be able to detect a whale in the exclusion zone. As CWA will be maintaining an exclusion zone with a radius of 750m (i.e., no pile driving will occur if a whale was within 750 m of the pile being driven) and the extent of the area with potentially injurious levels of noise extends no more than 150m, it is our determination that it is extremely unlikely any listed whales will be exposed to injurious levels of noise during pile driving. Therefore, our determination that whales are not likely to be adversely affected by levels of noise produced during pile driving remains valid.

In the 2010 Opinion, we considered that the 160 dB re 1uPa RMS isopleth would extend up to 3.4 km from the pile being driven. With the NAS, Cape Wind estimates that the 160 dB re 1uPa RMS isopleth will extend 680-1,360m from the pile being driven. BOEM will continue to require monitoring of a zone extending 3.4km from the pile being driven in order to document the presence of any listed species within this area during pile driving. With the NAS in place, the size of the area with potentially disturbing levels of noise (i.e., between 160 and 180 dB re 1uPa RMS) will be smaller than that considered in the 2010 Opinion (up to 4.05 km^2 with NAS compared to 34.56 km^2 considered in the 2010 Opinion). In the 2010 Opinion, we concluded that it is was extremely unlikely that any listed whales would be within 3.4 km of any pile being driven and therefore, effects of pile driving noise on listed whales was discountable. As the

extent of the 160 dB re 1uPa RMS isopleth will be even smaller than that considered in the 2010 Opinion, our conclusions remain the same. Additionally, as BOEM will require that Cape Wind monitor the SAS, in the unlikely event that any whales are present within Nantucket Sound, the location of these whales can be monitored and pile driving could be delayed until any whales leave the area. Based on the best available information and the analysis outlined herein, no right, humpback or fin whales will be exposed to noise levels greater than 160 dB. As such, no whales will be exposed to noise levels that could result in behavioral disturbance or harassment.

Cape Wind will install two more piles than considered in the 2010 Opinion. Given the precautions that will be taken to ensure that no pile driving occurs in the rare event that a whale is present within Nantucket Sound, the installation of two additional piles to support the ESP will not cause any effects not considered in the 2010 Opinion. Based on our analysis, the changes in the proposed action regarding the characteristics of the pile driving hammer, the installation of two additional 42" piles for the ESP, and the new requirement to use a bubble curtain, will not result in any effects to whales that were not considered in the 2010 Opinion.

Use of Vibratory Hammer

In the 2010 Opinion, we noted that vibratory and impact hammers would be used; however, the noise analysis was based on estimates for impact hammers. Cape Wind may use a vibratory hammer for boulder mitigation. Peak noise (at 1 m from the pile) for piles being installed with a vibratory hammer is estimated at 220 dB re 1uPa. Without a NAS, noise will attenuate to 147 dB re 1uPa RMS at 750 m and 134 dB re 1uPa RMS at 3.4 km. A monitored 750m exclusion zone will be maintained when the vibratory hammer is used; this ensures that no whales will be exposed to potentially injurious noise during vibratory pile installation. Vibratory pile installation is considered a continuous noise source. Criteria for assessing potential behavioral disturbance of whales are 120 dB re 1uPa RMS for continuous noise sources such as vibratory pile drivers. Whales are not likely to react behaviorally to underwater noise less than 120 dB. With the single bubble curtain providing a 14 dB reduction, noise will attenuate to 120 dB re 1uPa RMS at 3.1 km from the pile. BOEM states that if monitoring reveals that the single bubble curtain does not perform as expected, a second bubble curtain will be required. With a double curtain, expected to provide a 20 dB reduction, the distance to 120 dB re 1uPa is only 1.5 km. This is smaller than the zone of potentially disturbing level of noise considered in the 2010 Opinion (1.5-3.1 km radius compared to 3.4 km radius); therefore, there are no effects to listed whales not considered in the 2010 Opinion.

Sea Turtles

In the 2010 Opinion, we assessed the effects of exposure of Kemp's ridley, green, loggerhead and leatherback sea turtles to increased underwater noise resulting from installation of 6 piles to support the ESP and 130 WTG foundation piles. We determined that injury could result from exposure to underwater noise louder than 180 dB re 1uPa RMS and that exposure to noise 160 dB re 1uPa RMS or louder could result in behavioral disturbance. We determined that the number of sea turtles that would be exposed to noise levels between 160 and 180 dB re 1uPa RMS ranges between 3 and 7 for each pile installed.

Use of Impact Hammer

As explained above, the source levels (i.e., the underwater noise expected at 1m from the pile being driven) presented by Cape Wind in their July 2014 filing, are louder than the source levels assessed in the 2010 Opinion (241 dB re 1uPa peak with the impact hammer). As part of the proposed action considered in the 2010 Opinion, Cape Wind would use observers to maintain a 750m exclusion zone. That is, they would ensure that no pile driving took place if a sea turtle was within 750m of the pile being driven. This was to ensure that no sea turtles would be exposed to potentially injurious levels of underwater noise (expected to be experienced within 500m of the pile being driven). Now, Cape Wind is proposing to use a noise attenuation system (NAS; likely a single bubble curtain) as well as maintaining the 750m exclusion zone. Without the NAS, the extent of the 180 dB re 1uPa RMS isopleth is the same as was considered in the 2010 Opinion (noise attenuated to 178 dB re 1uPa RMS for the impact hammer). With the NAS, the 180 dB re 1uPa RMS isopleth will extend only 3.2-150 m from the pile being driven. As Cape Wind will be maintaining an exclusion zone with a radius of 750m, our determination that sea turtles are not likely to be adversely affected by levels of noise produced during pile driving remains valid.

In the 2010 Opinion, we considered that the 160 dB re 1uPa RMS isopleth would extend up to 3.4 km from the pile being driven. Without the NAS, Cape Wind now estimates that this isopleth would extend beyond 3.4 km, with noise levels at a distance of 3.4km at 164-165 dB re1uPa during impact hammering. With the NAS, Cape Wind estimates that the 160 dB re 1uPa RMS isopleth will extend 680-1,360m from the pile being driven. BOEM will continue to require monitoring of a zone extending 3.4km from the pile being driven in order to document the presence of any sea turtles within this area during pile driving. With the NAS in place, the size of the area with potentially disturbing levels of noise (i.e., between 160 and 180 dB re 1uPa RMS) will be smaller than that considered in the 2010 Opinion (up to 4.05 km^2 with NAS compared to 34.56 km^2 considered in the 2010 Opinion). Using the same methodology from the 2010 Opinion (i.e., number of sea turtles per square kilometer (0.09-0.19) multiplied by the size of the area where noise levels will be between 160 and 180 dB re 1uPa RMS), we estimate that no more than 1 (calculated 0.36-0.77) sea turtles will be exposed to potentially disturbing levels of noise during each pile driving event.

Cape Wind will install two more piles than considered in the 2010 Opinion. Even with these additional piles, the number of sea turtles expected to be exposed to potentially disturbing levels of noise will be less than considered in the 2010 Opinion (1 x 138 piles = 138 sea turtles exposed to potentially disturbing levels of noise vs. 3-7 x 136 piles = 408-952 sea turtles exposed to potentially disturbing levels of noise). The acoustic effects of pile installation will be less than those considered in the 2010 Opinion. There are no new effects introduced by the changes considered here.

Use of Vibratory Hammer

In the 2010 Opinion, we noted that vibratory and impact hammers would be used; however, the pile installation noise analysis was based on estimates for impact hammers. Cape Wind may use a vibratory hammer for boulder mitigation. Peak noise (at 1 m from the pile) for piles being installed with a vibratory hammer is estimated at 220 dB re 1uPa. Without a NAS, noise will attenuate to 147 dB re 1uPa RMS at 750 m and 134 dB re 1uPa RMS at 3.4 km. A 750m

exclusion zone will be maintained when the vibratory hammer is used. Sea turtles are not likely to react behaviorally to underwater noise less than 166 dB (McCauley 2000). Noise will attenuate to below 166 dB within the exclusion zone. Therefore, when the vibratory hammer is used, we do not anticipate that any sea turtles will be exposed to potentially injurious or disturbing levels of noise. In the 2010 Opinion, we did not anticipate any sea turtles would be exposed to injurious levels of noise. Therefore, the conclusions reached here are consistent with those reached in the 2010 Opinion.

Boulder Mitigation with Clamshell Dredge and Drilling

A 750m exclusion zone will be maintained anytime a clamshell dredge or drilling is used. Drilling is considered a continuous noise source, a clamshell dredge would be considered a non-continuous noise source. For the clamshell dredge, at 1m from the source noise will be 153 dB re 1uPa RMS, below the level that could result in injury to whales or sea turtles. Noise will have attenuated to background levels at 750m. Therefore, there is no potential for injury or behavioral disturbance when the clamshell dredge is used. Noise within 1m of the drill will be 124 dB re 1uPa; therefore there is no potential for injury. Noise will attenuate to below background levels within 750 m; therefore there is no potential for behavioral disturbance. Given this, it is extremely unlikely that the use of a clamshell dredge or drill will result in injury or behavioral disturbance of any whales or sea turtles. All acoustic effects of boulder mitigation during pile installation will be insignificant and discountable. Because the clamshell dredge and the drill will be operated inside of the hollow pile, we do not anticipate any other effects of use of the clamshell dredge or the drill; therefore, there will be no effects not considered in the 2010 Opinion.

Scour Protection

In the 2010 Opinion, we considered effects of installation of two scour protection alternatives, scour mats and rock armoring. Cape Wind is now proposing, and BOEM has approved, the use of rock armor. No changes to the amount of rock armor to be placed or to the installation methods are proposed. In the Opinion we determined that all effects of the installation and continued use of rock armor would be insignificant and discountable. These conclusions remain valid. Cape Wind is now proposing to carry out multi-beam surveys to inspect the rock armor deployments. The multi-channel multi-beam depth sounder operates at frequencies between 200-400 kHz (ESS, 2012). The multi-beam surveys will be focused at the WTG foundations on Horseshoe Shoals. No listed whales are expected to occur in the area where the rock armor inspections will occur. However, even if a listed whale was present near the survey, the equipment operates at a frequency that listed whales cannot hear; based on the best available information, sources with frequencies above 180 kHz do not appear to be perceived by these species (Richardson et al. 1995; Ketten 1998). Therefore, there would be no effect of any listed whales. Similarly, while listed sea turtles are seasonally present in the area where the survey will take place, the multi-beam depth sounders operate at frequencies above the hearing abilities of sea turtles. The information available for sea turtle hearing suggests that the auditory capabilities of sea turtles are centered in the low frequency range between 100 Hz and 2,000 Hz (Ridgway *et al.* 1969; Lenhardt *et al.* 1983; Bartol *et al.* 1999, Lenhardt 1994, O'Hara and Wilcox 1990). The only change in the scour protection protocol is the use of the multibeam survey. There are no effects of this survey on whales and sea turtles. Therefore, the changes to the scour protection

do not introduce any effects to listed whales or sea turtles that were not considered in the 2010 Opinion.

Conclusion

In the 2010 Opinion, we anticipated incidental take of sea turtles (harassment) from exposure to increased underwater noise during the pre-construction geophysical surveys and during the installation of piles to support the construction of the ESP and the 130 WTGs. No incidental take was anticipated to result from any other activities such as construction, operation and decommissioning because those effects would be insignificant and discountable. As we clarified in the amended ITS issued in May 2014, we do not anticipate incidental take of any listed whales due to any activities considered in the 2010 Opinion. Based on our review here, the proposed changes to the action will not result in any effects to listed whales or sea turtles or any critical habitat not considered in the 2010 Opinion. Our conclusions regarding the amount or extent of anticipated incidental take remain the same.

Based on this analysis, we have determined that reinitiation of consultation is not necessary. As such, the conclusions reached in our December 30, 2010 Opinion remain valid and no further consultation is necessary at this time. We look forward to continuing to work cooperatively with your office as the Cape Wind project moves forward. For further information regarding any consultation requirements, please contact Julie Crocker of my staff at (978)282-8480 or by e-mail (Julie.Crocker@noaa.gov).

Sincerely,

John K. Bullard
for Regional Administrator

Ec: Boelke – F/NER4
USACE
EPA
DOE

File Code: Section 7 BOEM – Cape Wind Reinitiation Review
PCTS: NER-2010-3866

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